

Our File No. 9281-4634
Client Reference No. S US02159

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
APPLICATION FOR UNITED STATES LETTERS PATENT

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TITLE: Mounting Structure of Wireless
Module Having Excellent
Productivity

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EXPRESS MAIL NO. EV 327 134 684 US

DATE OF MAILING 9/9/03

MOUNTING STRUCTURE OF WIRELESS MODULE HAVING EXCELLENT PRODUCTIVITY

BACKGROUND OF THE INVENTION

5 1. Field of the Invention

The present invention relates to a mounting structure of a wireless module suitable to be used in a wireless transceiver such as a portable phone or a personal computer.

2. Description of the Related Art

10 The conventional mounting structure of a wireless module will be explained with reference to the drawings wherein Fig. 3 is a perspective view illustrating a wireless module relating to the conventional mounting structure of a wireless module, and Fig. 4 is a perspective view illustrating the
15 conventional mounting structure of the wireless module.

Next, a configuration of the conventional mounting structure of the wireless module will be described with reference to Figs. 3 and 4. In a circuit board 51 constructed by laminating one sheet or a plurality of sheets,
20 electrical components 52 such as chip type resistors or capacitors including semiconductor components are mounted on its upper surface wherein wiring patterns (not shown) are formed, so that a desired electric circuit comprising a receiving/transmitting circuit is formed.

25 A cover 53 made of a solderable metal plate has a box-shaped cover portion 53a and a plurality of attaching pieces 53b projected downward from the lower end of the cover portion 53a. In a state wherein the cover portion 53a of the

cover 53 covers the electrical components 52, the cover 53 is attached to the circuit board 51 by soldering solders 55 of the attaching pieces 53b to side electrodes 54 provided in the circuit board 51.

5 With this configuration, a wireless module M2 is formed (for example, see Japanese Unexamined Patent Application Publication No. 1999-31893).

 With such wireless module M2, the circuit board 51, as shown in Fig. 4, is put on a motherboard 56, the circuit
10 board 51 is mounted on conductive patterns 57 of the motherboard 56 with solders 58, and thus the circuit board 51 is electrically connected to the motherboard 56.

 In this state, the solders 55 for attaching the cover 53 are externally exposed, and thus the cover 53 can be easily
15 separated by melting the solders 55. As a result, violation such as exchange of memory or alteration of output power in the wireless module M2 becomes easy.

 Therefore, conventionally in order to prevent such violation, as shown in Fig. 4, a protective cover 59 for
20 covering the wireless module M2 is provided on the motherboard 56. The protective cover 59 is attached to the motherboard 56 with special screws (not shown) which can be attached and detached by means of a special tool.

 In the conventional mounting structure of the wireless
25 module, since the protective cover 59 for covering the wireless module M2 and the special screws for attaching the protective cover 59 to the motherboard 56 are required in order to prevent the violation. Thus, the prior art has

problems in that the cost increases due to more components, has some difficulties in attaching the protective 59, and thus lowers the productivity.

5 SUMMARY OF THE INVENTION

Therefore, it is an object of the present invention to provide a mounting structure of a wireless module having low cost and excellent productivity.

As a first solving means for solving the above problems,
10 a mounting structure of a wireless module is provided, the mounting structure comprising: a circuit board having electrical components including semiconductor components mounted on its upper surface; a cover attached to the circuit board while covering the electrical components; and a
15 motherboard for mounting the circuit board thereon, wherein the cover has a box-shaped cover portion and one or a plurality of leg portions projected downward from the cover portion, wherein first through holes for inserting the leg portions are provided in the circuit board, and second
20 through holes for inserting the leg portions are provided in the motherboard, and wherein the leg portions are soldered to the circuit board and the motherboard at the first and second through holes or at positions close to the first and second through holes in a state that the leg portions are inserted
25 into the first and second through holes, respectively.

Further, as a second solving means, the circuit board is put on the motherboard to overlap each other.

Further, as a third solving means, conductors are

provided on the walls of the first and second through holes, and the leg portions are soldered to the conductors.

Further, as a fourth solving means, the leg portions extend in a straight line.

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BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view illustrating a mounting structure of a wireless module according to the present invention;

10 Fig. 2 is a cross-sectional view illustrating essential parts of the mounting structure of the wireless module according to the present invention;

Fig. 3 is a perspective view illustrating a wireless module relating to the conventional mounting structure of a
15 wireless module; and

Fig. 4 is a perspective view illustrating the conventional mounting structure of the wireless module.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

20 A mounting structure of a wireless module according to the present invention will be explained with reference to the drawings wherein Fig. 1 is a perspective view illustrating a mounting structure of a wireless module according to the present invention, and Fig. 2 is a cross-sectional view
25 illustrating essential parts of the mounting structure of the wireless module according to the present invention.

Next, a configuration of the mounting structure of the wireless module according to the present invention will be

described with reference to Figs. 1 and 2. In a circuit board 1 constructed by laminating one sheet or a plurality of sheets, electrical components 2 such as chip type resistors or capacitors including semiconductor components are mounted on its upper surface wherein wiring patterns (not shown) are formed, so that a desired electric circuit comprising a receiving/transmitting circuit is formed.

Further, a plurality of through holes 1a is provided in the circuit board 1, and solderable conductors 3 are provided on the walls of the through holes 1a.

Then, although not shown herein, connection conductors are provided on the lower surface or side surface of the circuit board 1, and thus the circuit board 1 can be electrically connected to the outside thereof through the connection conductors.

A cover 4 made of a solderable metal plate comprises a box-shaped cover portion 4a and a plurality of leg portions 4b provided at corners of the cover portion 4a and projected downward from the lower end of the cover portion 4a in a straight line. In a state wherein the cover portion 4a of the cover 4 covers the electrical components 2, the leg portions 4b are inserted into the through holes 1a, and the leg portions 4b are attached to the circuit board 1 by soldering solders 5 to the conductors 3.

With this configuration, a wireless module M1 is formed.

Further, a motherboard 6 for mounting the circuit board 1 thereon has conductive patterns 7 and a plurality of through holes 6a, and solderable conductors 8 are provided on

the walls of the through holes 6a.

Then, the circuit board 1 is put on the motherboard 6 to overlap each other, and the leg portions 4b are inserted into the through holes 6a.

5 In this state, by soldering the connection conductors of the circuit board 1 to the conductive patterns 7, the circuit board 1 is electrically connected to the motherboard 6, and the leg portions 4b are attached to conductors 8 with solders 9.

10 The soldering of the circuit board 1 to the motherboard 6 and the soldering of the leg portions 4b to the conductors 8 with the solders 9 are performed in the simultaneous process by using a cream solder.

15 Furthermore, although the above embodiment has been described that the plurality of leg portions 4b are formed, only one leg portion may be formed.

20 Further, although the leg portions 4b have been described to extend in a straight line, the leg portions 4b inserted into the through holes 1a may be bent into an L shape on the lower surface side of the circuit board 1, and then the end of the L shape may be inserted into the through holes 6a of the mother substrate 6.

Further, the leg portions 4b may be soldered at positions close to the through holes 1a, 6a.

25 The mounting structure of the wireless module according to the present invention comprises the circuit board having the electrical components including the semiconductor components mounted on its upper surface; the cover attached

to the circuit board while covering the electrical components; and the motherboard for mounting the circuit board thereon, wherein the cover has the box-shaped cover portion and one or a plurality of leg portions projected
5 downward from the cover portion, wherein first through holes for inserting the leg portions are provided in the circuit board, and second through holes for inserting the leg portions are provided in the motherboard, and wherein the leg portions are soldered to the circuit board and the
10 motherboard at the first and second through holes or at positions close to the first and second through holes in a state that the leg portions are inserted into the first and second through holes, respectively. Accordingly, the cover also serves as a conventional protective cover. Therefore,
15 this invention has less components than the conventional art, decreases the cost, simplifies the mounting process of the cover, and thus provides excellent productivity.

Further, since the leg portions are attached in a state wherein the leg portions are inserted into the first and
20 second through holes, it is difficult to peel off the solders of the leg portions. Thus, it is possible to surely prevent the violation.

Further, since the circuit board is put on the motherboard to overlap each other, it becomes more difficult
25 to peel off the solders of the leg portions. Thus, it is possible to prevent the violation with more certainty.

Further, since the conductors are provided on the walls of the first and second through holes and the leg portions

are soldered to the conductors, it becomes more difficult to peel off the solders of the leg portions. Thus, it is possible to prevent the violation with more certainty.

Further, since the leg portions extend in a straight
5 line, the cover can be manufactured simply, and it is possible to easily attach the cover to the circuit board and the motherboard, which provides excellent productivity.